# **NDO Visual Guide**

Logility's Network Optimization (NDO)



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# 1. Where to get help

- Search the knowledge base: <u>Knowledge Base</u>
- Join weekly office hours every Thursday: Office Hours
- Search or Post a question in the Help Widget
- Open the Tactician's Corner







<u>Visualization Controls</u>: The eyeball icon allows you to control what you see on the page. Use this to turn off and on what you see or control the coloring and sizing of customers



### 2. Navigation >> Scenario Selector





# 2. Navigation >> Scoreboard



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## 2. Navigation >> Magic Sextant



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Saving: You don't need to do a thing—any action you make is automatically saved

Undoing: A user can undo a click and drag to restore a node to its previous location. Otherwise, there is no undo. Our environment is all maintained in memory with a lot of moving, interrelated parts making undo a complex challenge.

Solving: Every time you make a change to your network in the interface, the solver will automatically optimize based on existing nodes and lanes. Unless, the "Auto recalc mode" is set to off (see below)



Setting objective function for scenario

Toggle on and off auto-optimization (recalc)



**BEST PRACTICE**: Duplicate your scenario whenever you want to make changes —that way you have a copy to which you can revert

# 2. Navigation: Right Clicking



#### In an open space on the map:

- Add a node to map
- Add multiple nodes to the map
  - When you "add multiple" you will see a box at the bottom that allows you to







#### Over a node on the map:

- Duplicate/Disable or Delete the object
- Make connections to other nodes (with selected node as the origin)
- Change location (type in address to "Location" field)

### 3. Building Blocks: What is an object?

Object	Definition
Node	Any point on the map that represents a facility or waypoint through with material can travel. A node can be anything a user wants it to be including a workcenter, plant warehouse, loading dock, etc.
Lane	A connection between two nodes that allows product flow from origin to destination. Lanes do have directionality so make sure they are pointed in the right direction.
Supply node	A node that is designated to supply products – it is the start of a path
Demand Node (Customer)	A node that receives products – it is the end of a path. NOTE: if a "demand" cannot find a path to a "source", product will not flow there.
Path	The chain of nodes and links through which product travels from a source to a demand point. Demand can be fulfilled along multiple paths.



**BEST PRACTICE**: Go to the glossary whenever you have a question: <u>Knowledge Base Glossary</u>

# 3. Building Blocks: What is an activity?



Concept	Definition	Example
Activity	Users can add and name any number of activities on an object. An activity represents a process or function that incurs cost, time, distance, and/or emissions. An object can contain any number of activities. Activities can be user-defined or will be automatically generated as needed (e.g., transportation activities).	<ul> <li>A plant node might have an activity called "Handling" that costs \$1/unit (as a variable cost)</li> <li>A warehouse might have an activity called "Lease" that costs \$500K (as a fixed cost)</li> <li>A port might have an activity called "processing" that costs 2 days</li> </ul>
System Generated Activity	Any activity that utilizes reference data and inputs in the Configuration Section (Scenario Selector>>configuration button)	<ul><li> "Transport" rates on a line</li><li>Labor costs on a node</li></ul>
Base Metric	<ul> <li>An activity can have 1 to 5 of the following metrics input:</li> <li>Cost (variable)</li> <li>Cost (fixed)</li> <li>Time</li> <li>Distance</li> <li>CO2 Emissions</li> <li>These metrics can be formulated based on flow, other metrics, or reference data.</li> </ul>	<ul> <li>"handling" might incur a time metric of 24 hours</li> <li>Transportation might incur a cost metric of \$0.10/lb</li> </ul>
- Calculated Metric	- A metric that is derived from the cost, time, and distance metrics.	<ul> <li>- "Cost to serve" is calculated at the customer based on all the costs found on the path to that particular Demand Point.</li> <li>- End to End (E2E) Service time is the sum of all times on the path that lead to a demand point</li> </ul>
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# 3. Building Blocks: Adding Activities

Change for All nodes of a type:

- 1. Left click on facility icon
- 2. Expand inspector
- 3. Select "+ New Activity"
- 4. Add in any combination of metrics for variable cost, fixed cost, Time, Distance, and Emissions





## 3. Building Blocks: How NDO sees a supply chain



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Node Types: Every Node belongs to a "Type". And this "Type" defines its Icon, whether it is a source or not, if it has demand, and what activities are attached to it. These attributes can all be changed in the interface, but the "Type" gives it a start and you will see "Type" show up in some of the global actions

NOTE: Any node can have "activities", "Product Supply", and "Constraints" set regardless of type

Туре	Created as a Source	Created with Demand	Default Icon	Starting Activities (preprogrammed)	Metrics and Formulas
Plant	Yes	-		Labor and Lease can be assigned in Configuration Panel	
Warehouse		-		Labor and Lease can be assigned in Configuration Panel	
Cross Dock		-		Labor and Lease can be assigned in Configuration Panel	
Port		-	<b>?</b>	Labor and Lease can be assigned in Configuration Panel	
Customer	-	Yes	••••		
Supplier		-	$\mathbf{Q}$	Labor and Lease can be assigned in Configuration Panel	
Add any		-			



# 3. Building Blocks: Specialty Icons – Specialty icons can be added to enhance your story telling

Change for All nodes of a type:

- 1. Open Scenario Selector>>Configuration>>Facilities
- 2. Left click on the type icon





- 1. Left click on node
- 2. Open inspector
- 3. Left click on the type icon





#### Every Link will belong to a mode. A mode can be anything that your company wishes to define to connect two nodes

Link	Buttons	Starting Activities (preprogrammed)	Metrics and Formulas
Ground Parcel		Transportation: parcel	Cost = Flow * < <reference (cost="" data="" lb)="">&gt; Time = &lt;<reference (days)="" data="" time="">&gt; Distance=&lt;<reference (miles)="" data="" distance="">&gt;</reference></reference></reference>
Less than Truckload (LTL)		Transportation: LTL	Cost = Flow * < <reference (cost="" data="" lb)="">&gt; Time = &lt;<reference (days)="" data="" time="">&gt; Distance=&lt;<reference (miles)="" data="" distance="">&gt;</reference></reference></reference>
Full Truckload (FTL)		Transportation: FTL	Cost = Flow * < <reference (cost="" data="" lb)="">&gt; Time = &lt;<reference (days)="" data="" time="">&gt; Distance=&lt;<reference (miles)="" data="" distance="">&gt;</reference></reference></reference>
Full Truck Load (FTL f(x)		Transportation: FTL f(x)	Cost = Flow * < <user cost="" entered="" km="" mile="" per="">&gt; Time = &lt;<reference (days)="" data="" time="">&gt; Distance=&lt;<reference (miles)="" data="" distance="">&gt;</reference></reference></user>
Ocean		Transportation: Ocean	Cost=Users add their own Time= User added Distance=User added
Intermodal		Transportation: Intermodal	Cost = Flow * < <reference (cost="" data="" lb)="">&gt; Time = &lt;<reference (days)="" data="" time="">&gt; Distance=&lt;<reference (miles)="" data="" distance="">&gt;</reference></reference></reference>



There are 5 basic dimensional metrics that define a Logility Network Optimization supply chain model, these are created in "activities" and can be combined by formulas to create calculated metrics.

Metric	ИОМ	Notes
Flow	Weight	Implies units per time of model—if you load up a month of demand flow will be in lbs/month etc.
Currency (cost)	Currency	
Time	Days	
Distance	Miles or Kilometers	
Emissions	Imperial pounds or kilograms	



## 4. Metrics/Graphs and Reports: Calculated Metrics

Metric	Feature of	Definition	иом	Reporting
Total Landed Cost	Model	The sum of all costs incurred in the supply chain	Currency	Model: Stacked Bar chart Scenario: Pie Chart Object: Pie Chart/pop up item
Cost To Serve	Demand Points (customers)	Sum of all per unit costs from the source node to the demand node. It is the total landed cost to get one unit through its path.	Currency/unit	Object: Single number report / pop up item
Flow	Scenario-Object	The total per unit flow of material through a node or through a link	Units	Scenario: Bar chart + table chart Object: Single number report
E2E Service Time	Demand Points (customers)	Sum of all time incurred on all paths to a demand point. Weighted by flow the demand point if there are more than one paths.	Time	Model: Bar chart Scenario: Histogram
Average E2E Service Time	Model	Weighted average of all the E2E service times based on flow or number of demand points	Time	Model: Bar chart Scenario: Single number report
E2E Service Distance	Demand Points (customers)	Sum of all per time consumed on all paths to a demand point. Weighted by flow the demand point if there are more than one paths.	Distance	Model: Bar chart Scenario: Histogram
Average E2E Service Distance	Model	Weighted average of all the E2E service times based on flow or number of demand points	Distance	Model: Bar chart Scenario: Single number report
Total E2E Service Distance	Model	Sum of all miles actively traveled (flow>0) in the supply chain	Distance	Model: Bar chart Scenario: Single number report
Customer Service Time	Demand Points (customers)	Sum of time to deliver material to a demand point from the last point on the supply chain (last leg).	Time	Model: Bar chart Scenario: Histogram
Average Customer Service Time	Model	Weighted average of all the Customer service times based on flow or number of demand points	Time	Model: Bar chart Scenario: Single number report
Utilization	Object	The percentage of an object's capacity that is utilized—when a capacity is enabled	Percent	Object: Stacked bar chart (in beta)



# 5. Reference Data: Logility Network Optimization relies on layers of reference data to complete the metrics in your model





Global (model level) settings

Customer node settings

#### Facility node settings

Lever	Affects	Interface Control	Description
Region	Currency, distance, and weight measurements	Scenario Selector>>Configuration>>Region	
Units per order – Global	Weight Break for LTL Weight Break for Ground Parcel	Scenario Selector>>Configuration>>Product	If a local "average order size" is not present, the global will be used to look up the appropriate weight break
Units per Truck	FTL and FTL f(x) Costs	Scenario Selector>>Configuration>>Product	
Units per Container	Ocean and Intermodal Rates	Scenario Selector>>Configuration>>Product	
Density Class	LTL Costs	Scenario Selector>>Configuration>>Product	
Mode Discount Factor (Calibration Factor)	Cost per mode	Scenario Selector>>Configuration>>Transportation	Serves as a direct cost multiplier to the mode. Use it to correct for market adjustments, fuel service charges, accessorial, or modeling future demand
Minimum shipment cost	Cost per mode	Scenario Selector>>Configuration>>Transportation	Sets a minimum cost for a total shipment
Labor hours per unit	Facility costs	Scenario Selector>>Configuration>>Facility	Variable cost for labor based on reference data
Facility size	Lease costs	Scenario Selector>>Configuration>>Facility	Fixed cost for lease based on reference data
Demand Quantity	Flow Quantity	Node Selector>>Node Inspector>>Demand	The amount of product consumed by a customer
Average Order Size - Local	Weight Break for LTL Weight Break for Ground Parcel	Node Selector>>Node Inspector>>Demand	This value supersedes the Global average order size
Preferred Mode/Carrier	Mode used to service that line of demand	Node Selector>>Node Inspector>>Demand	
Supply	What products can be supplied by what facilities	Node Selector>>Node Inspector>>supply	
Capacity		Node Selector>>Node Inspector>>capacity	
Activities	Costs, times, distance	Node Selector>>Node Inspector>>activities	



# 6. Calculation Levers: Scaling order sizes

What do order sizes do?: The order size determines the cost of order based delivery modes such as LTL and Ground Parcel. If an order size is large, it generally costs less per pound.

GLOBAL DEFAULT: Applies to all deliveries unless a local average is defined

Where to find: Scoreboard-Model-Actions

LOCAL AVERAGE: Only applies to that customer

Where to find: Customer>>inspector>>Properties

Example:

- Set the Global "Units Per Order" to 100.00 (lb)
- Create a link between Las Vegas and Minneapolis using LTL
- The cost per unit will be 0.4 (\$/lb)
- I change weight per order to 6000, the cost will move to the next weight bracket
- The new cost per unit will go down to 0.14 (\$/lb)





# 6. Calculation Levers: Discount Factor

Discount Factor: A multiplier that scales the costs up or down for a designated mode

Where to find: Scenario Selector>>Configuration>>Transport

Definition: Discount is really just a number that is multiplied by the reference data costs for that mode.

Net Cost = (Reference data cost) \* (Discount)

Example:

- Create a link between Las Vegas and Minneapolis using LTL.
- The cost per unit will be 0.14 (\$/lb)
- If I change to discount to 0.9
- The new cost per unit will be 0.126 (\$/lb)

Use the is discount factor to account for:

- Benchmark differences between reference data and actual lanes
- Fuel service charge
- Profit margin
- Premium or discount services





### 7. Importing Data with Spreadsheets: Using the Model Maker

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- Download the Logility Network Optimization Model Maker from the "Tactician's Corner" There are two types:
  - Components if you wish to enter in facilities, customer, lanes, activities
  - Shipment this takes a shipment table and makes in import that makes every origin into a warehouse and every destination into a customer
- Read the "instructions" tab for general instructions
- Summary of instructions:
  - You do not need to fill out each table
  - For the tables you do have data in, the columns with green headers are required
  - Hover your mouse over the name of a column to get a description of the data
  - When you are ready to create an export file, go to the "Instructions" tab and click the button
  - This will prompt you to choose a directory to save the corresponding Logility Network Optimization import file which you can then import via drag and drop or the "Import" option in the Sextant.

ogility Network Optimization M	odel Maker	
tructions: O. Visit each tab and fill out as required I. Fill in each required column (read comments on titles for data dictiona 2. Push the button and file will be saved in the same directory as this file o Click to Build Import File 3. You can now go to the interface to import the file you created te: This spreadsheet was built with a minimum of protection so that users n visual basic and can modify as they require. Please read warnings and be columns and rows	ry): r type (ctl-b) ight have access to the c careful about adding	
rnings: 1. Macro rec the right of 2. Facility Name 3. Columns 4. Canadian 5. You are fr a. It m b. you 0.0 - Logility R Instruction	stal Code (or city, state or city)               S Postal Code: Required Field:           31            27            Definition: This should be the postal code, city or city-state in which the facility is to be plotted.          Full addresses will not be plotted and postal code should be in 5 digit format	5



Look for other "Playbooks" to learn to:

- Create a baseline scenario from actual shipment data
- Benchmark to "dial in" reference data
- Aggregate based on the complexity of your model
- Model inbound costs for use in an outbound model.



# Start simple: Make 1 customer and 1 product function properly

- ✓ Confirm you have a supply node (the beginning of the supply chain) with the correct product selected
- ✓ Confirm you have a customer node with demand for the correct product
- $\checkmark$  Confirm you have lanes that go from supply to





# Start simple: Make 1 customer and 1 product function properly

- ✓ Confirm the flow from the supply node to the customer is as expected (previous page)
- ✓ Open the service diagram (left click customer>>expand inspector on right)
- ✓ Walk through object by object and find where costs or off specifically: Each cost is a result of an activity, if you identify the activity that is missing or wrong, you will know how to fix it.





# 9. Troubleshooting

Problem	Symptom	Resolution
Access to browser / login	Continuous spinner or error code	Refresh browser Log in / out again Type error code into knowledge base (help widget)
Classic import/upload problems	Import reports unknown nodes	Review import file to make sure all node name exactly match column A in the "nodes" tab
	Lanes do not import	Ensure all lane modes match acceptable inputs (FTL, LTL, Intermodal)
	Nodes do not geocode properly	
I click on two nodes but don't get any mode options	One of the nodes may not be on a known location. Example: if you drop a node in a lake or desert, it might not find a postal code	Look in your node properties to see if a postal code is listed.
	Confirm that you are connecting two nodes that should have reference data	The reference data will not connect two nodes that have either illogical modes (EXAMPLE: Full truck load to Hawaii) or nodes that are outside the reference data coverage
I click on generate report Or I click on export and nothing happens	Pop-up blocker is blocking that site	Look for the pop-up blocker and allow pop-ups for your url
Some of my demand points do not connect when I use a Solve	One of the nodes may not be on a known location. Example: if you drop a node in a lake or desert, it might not find a postal code	Look in your node properties to see if a postal code is listed.
	Confirm that you are connecting two nodes that should have reference data	The reference data will not connect two nodes that have either illogical modes (EXAMPLE: Full truck load to Hawaii) or nodes that are outside the reference data coverage



# 9. Troubleshooting Tip – make a logic diagram and ensure there is forward (not looping) flow









#### Weight Break Lookup Table

weight_break_name	weight_break_lookup_wt	weight_break_min_wt	weight_break_max_wt	weight_break_table
L5C	250	0	500	North American LTL
M5C	500	500	1000	North American LTL
M1M	1000	1000	2000	North American LTL
M2M	2000	2000	5000	North American LTL
M5M	5000	5000	10000	North American LTL
M10M	10000	10000	20000	North American LTL
M20M	20000	20000	30000	North American LTL
M30M	30000	30000	40000	North American LTL
M40M	40 000	40000	1E+09	North American LTL

#### Density Class Table and Coefficient

Geography	Product Class	Example	Min Density	Max Density	Density Units	Coefficient applied to Tariff
north america	500	Bags of gold dust, ping pong balls	0	1	lb per sqft	5.88235294
north america	400	Deer antlers	1	2	lb per sqft	4.70588235
north america	300	wood cabinets, tables, chairs setup, model boats	2	3	lb per sqft	3.52941177
north america	250	Bamboo furniture, mattress and box spring, plasma TV	3	4	lb per sqft	2.94117647
north america	200	Auto sheet metal parts, aircraft parts, aluminum table, packaged mattresses,	4	5	lb per sqft	2.35294118
north america	175	Clothing, couches stuffed furniture	5	6	lb per sqft	2.05882353
north america	150	Auto sheet metal parts, bookcases,	6	7	lb per sqft	1.76470588
north america	125	Small Household appliances	7	8	lb per sqft	1.47058824
north america	110	cabinets, framed artwork, table sa w	8	9	lb per sqft	1.29411765
north america	100	boat covers, car covers, canvas, wine cases, caskets	9	10.5	lb per sqft	1.17647059
north america	92.5	Computers, monitors, refrigerators	10.5	12	lb per sqft	1.08823529
north america	85	Crated machinery, cast iron stoves	12	13.5	lb per sqft	1
north america	77	Tires, bathroom fixtures	13.5	15	lb per sqft	0.90587123
north america	70	Car accessories & car parts, food items, automobile engines	15	22.5	lb per sqft	0.85962349
north america	65	Car accessories & car parts, bottled beverages, books in boxes	22.5	30	lb per sqft	0.81509499

